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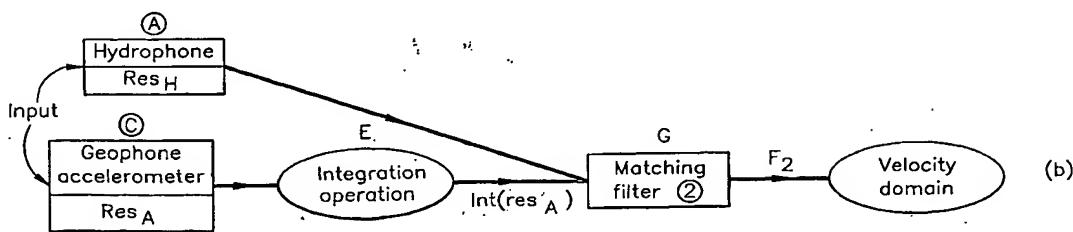
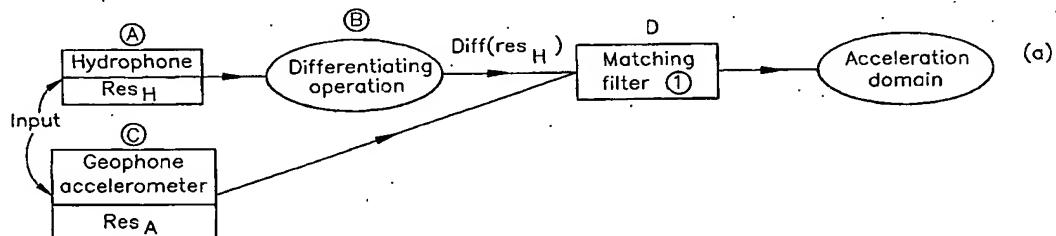
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(54) Title: PROCESSING SEISMIC DATA



(57) Abstract: A method of matching the impulse response of a hydrophone and the impulse response of a geophone accelerometer comprises performing a calculus operation upon the response of one of the hydrophone and the accelerometer. A filter is then derived from the output of the calculus operation and the response of the other of the hydrophone and the accelerometer. The filter may then be used to match seismic data acquired by the one of the hydrophone and the accelerometer to seismic data acquired by the other of the hydrophone and the accelerometer. The calculus operation may comprise differentiating the hydrophone response, or integrating the accelerometer impulse response.

WO 2004/046759 A1

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 030 400 A (HUNTEC LTD) 2 April 1980 (1980-04-02) abstract figure 2 ---	1-19
X	WO 00 55648 A (BEDNAR EUGENE D ;INPUT OUTPUT INC (US)) 21 September 2000 (2000-09-21) page 4, line 19 - line 24 abstract ---	1-19
X	US 5 408 441 A (BARR FREDERICK J ET AL) 18 April 1995 (1995-04-18) abstract; figure 13 ---	1-19
A	US 4 222 266 A (THEODOULOU SAMUEL M) 16 September 1980 (1980-09-16) abstract; figure 1 ---	1-19
	-/-	

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Date of the actual completion of the International search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 091 356 A (HUTCHINS ROGER) 23 May 1978 (1978-05-23) abstract; figure 2 ----	1-19
A	US 5 365 492 A (DRAGOSET JR WILLIAM H) 15 November 1994 (1994-11-15) figure 4 ----	1-19
A	US 4 253 164 A (HALL JR ERNEST M) 24 February 1981 (1981-02-24) column 1, line 55 - line 61 -----	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/04935

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
GB 2030400	A	02-04-1980	CA	1137205 A1		07-12-1982
WO 0055648	A	21-09-2000	AU	3517600 A		04-10-2000
			AU	3628900 A		04-10-2000
			AU	3631700 A		04-10-2000
			AU	3730700 A		04-10-2000
			AU	3744300 A		04-10-2000
			AU	3751100 A		04-10-2000
			AU	3879800 A		04-10-2000
			AU	3933900 A		04-10-2000
			AU	4503500 A		04-10-2000
			CA	2365868 A1		21-09-2000
			CA	2365886 A1		21-09-2000
			CA	2366317 A1		21-09-2000
			CA	2366320 A1		21-09-2000
			CA	2366999 A1		21-09-2000
			CA	2367983 A1		21-09-2000
			CA	2368127 A1		21-09-2000
			CA	2368262 A1		21-09-2000
			EP	1169657 A1		09-01-2002
			EP	1169896 A1		09-01-2002
			EP	1192419 A1		03-04-2002
			EP	1183555 A1		06-03-2002
			EP	1175628 A1		30-01-2002
			EP	1166595 A1		02-01-2002
			EP	1177451 A2		06-02-2002
			EP	1208385 A1		29-05-2002
			JP	2002539444 T		19-11-2002
			JP	2003521675 T		15-07-2003
			JP	2002539460 T		19-11-2002
			JP	2002539632 T		19-11-2002
			NO	20014458 A		09-11-2001
			NO	20014459 A		16-11-2001
			NO	20014460 A		16-11-2001
			NO	20014461 A		15-11-2001
			NO	20014463 A		14-11-2001
			NO	20014464 A		16-11-2001
			NO	20014469 A		24-10-2001
			WO	0055648 A1		21-09-2000
			WO	0055652 A1		21-09-2000
			WO	0056117 A1		21-09-2000
			WO	0055105 A2		21-09-2000
			WO	0056132 A1		21-09-2000
			WO	0055646 A1		21-09-2000
			WO	0055577 A1		21-09-2000
			WO	0055593 A2		21-09-2000
			WO	0055638 A1		21-09-2000
			US	6301195 B1		09-10-2001
US 5408441	A	18-04-1995	EP	0666991 A1		16-08-1995
			WO	9506263 A1		02-03-1995
US 4222266	A	16-09-1980	CA	1136255 A1		23-11-1982
			GB	2029582 A , B		19-03-1980
US 4091356	A	23-05-1978	CA	1039397 A1		26-09-1978
			DE	2738416 A1		01-06-1978
			GB	1548794 A		18-07-1979

INTERNATIONAL SEARCH REPORT

nation on patent family members

Intern: I Application No

PCT/GB 03/04935

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 5365492	A	15-11-1994	AU	671036 B2	08-08-1996	
			AU	7328094 A	28-02-1995	
			BR	9405543 A	08-09-1999	
			CA	2145281 A1	16-02-1995	
			DE	69420250 D1	30-09-1999	
			EP	0666992 A1	16-08-1995	
			JP	2659461 B2	30-09-1997	
			JP	8501395 T	13-02-1996	
			NO	951270 A	18-05-1995	
			RU	2116657 C1	27-07-1998	
			WO	9504945 A1	16-02-1995	
US 4253164	A	24-02-1981		NONE		